"Note on the Spectrum of μ Centauri." By Sir NORMAN LOCKYER, K.C.B., LL.D., Sc.D., F.R.S., and F. E. BAXANDALL, A.R.C.Sc. Received January 4,—Read February 9, 1905.

An investigation of Pickering's reproduction of this spectrum*—which apparently consists of the spectrum of an Orion star + bright hydrogen lines and certain other bright lines of minor intensity—suggested that the latter are radiation lines corresponding to some of the stronger absorption lines of α Cygni. These α Cygni lines have previously been attributed to the enhanced lines of certain metals, chiefly Fe, Ti, Cr, Mg, and Si.

A close investigation has now shown that nearly all the most marked bright lines in μ Centauri—other than those of hydrogen—occupy positions closely corresponding to those of the most conspicuous enhanced lines of iron. The wave-lengths of some of the bright μ Centauri lines are compared with those of the enhanced lines of iron and α Cygni lines in the table at the end of this note. The close agreement is very noticeable.

It is worth while, then, to analyse in detail Pickering's statement in his note† on the μ Centauri spectrum. He states: "Lines 4922·1 and 5015·8 are bright on the edge of greater wave-length." The lines whose wave-lengths he gives are the helium-Orion absorption lines. The only two enhanced iron lines in this region are at $\lambda\lambda$ 4924·11 and 5018·63, which occupy exactly the positions relatively to the helium lines which Pickering notes as being bright in the μ Centauri spectrum—that is, they border the helium lines on the edge of greater wave-length.

Again, he says: "The two most conspicuous (bright lines) are at wave-lengths 4232 and 4584 approximately." Two of the most marked lines in the α Cygni spectrum are at $\lambda\lambda$ 4233·25 and 4584·02, and these undoubtedly correspond to the two most conspicuous enhanced lines of iron between H_δ and H_β.

Again. "Line 4387·8 is bright on the edge of shorter wave-length." In α Cygni there is a well-marked line at λ 4385·55, which agrees in position with another enhanced iron line.

Also: "A diffuse bright band appears on the side of shorter wave-length of the dark line 4531·4." There is a distinctive group of α Cygni—enhanced iron lines at $\lambda\lambda$ 4508·46, 4515·51, 4520·40, 4522·69, which, thrown together into an irresolvable group in μ Centauri, may well correspond to the diffuse line quoted by Pickering.

Further: "The dark line 4553·4 is superposed on a bright band."

* 'Annals Harv. Coll. Obs.,' vol. 28, Part II, Plate 1.

† 'Annals Harv. Coll. Obs.,' vol. 28, Part II, p. 178.

Bright Lines in the Spectrum of μ Centauri.

λ (μ Centauri).	Nature.	Probable origin.	λ of probable origin.	α Cygni.		Remarks.
				λ.	Intensity (Max. 10).	
4171·4 to 4181·4	Bright and broad	*p* Fe	4173·52	4173·5	6—7	Mean position of Fe double 4176·2, that of the μ Centauri line 4176·4.
			4178·95	4179·0	6—7	
4232·9	Very bright and narrow	*p* Fe	4233·25	4233·3	8	
4295·7 to 4303·1	Bright but not well-marked	*p* Fe	4296·65	4296·7	4	Mean position of Fe double 4299·9, that of μ Centauri line 4299·4.
			4303·34	4303·3	5	
4385·0	Bright and narrow	*p* Fe	4385·55	4385·5	5—6	
4508·9	,, ,,	*p* Fe	4508·46	4508·5	5	
4515·1	,, ,,	*p* Fe	4515·51	4515·5	5	
4518·6 to 4527·6	Bright but irresolvable	? *p* Fe + extra line	4520·40	4520·4	4	Mean position of *p* Fe double 4521·5, that of μ Centauri line 4523·3.
			4522·69	4522·7	5	
4549·9	Bright and narrow	*p* Fe	4549·64	4549·8	7	
4556·3	,, ,,	*p* Fe	4556·06	4556·1	5	
4584·6	Very bright	*p* Fe	4584·02	4584·0	7	

This bright band may very well correspond to the α Cygni enhanced iron lines 4549·64 and 4556·06 thrown together in the μ Centauri spectrum. It is possible, though, that the dark line 4553·4, quoted by Pickering, is only the dark interspace between the bright 4549·64 and 4556·06 lines.

It may be here remarked that among the brightest lines in the spectra of Novæ at their initial stages are lines agreeing in position with the most marked α Cygni and enhanced Fe lines, and in this way we trace a resemblance between the minor bright lines of μ Centauri and the most conspicuous bright lines—other than those of hydrogen —in the early spectra of Novæ.

Lines corresponding to these bright lines in μ Centauri also occur in the spectrum of γ Cassiopeiæ, but they are far less well-defined in the case of the latter star.

The wave-lengths of the μ Centauri lines given in the table were reduced, by means of Hartmann's formula, from measures made on Pickering's reproduction, the fiducial lines used being 4121·0 (He), H_γ, and $H\beta$.

"On Europium and its Ultra-violet Spectrum." By Sir William Crookes, D.Sc., F.R.S. Received January 26,—Read February 9, 1905.

Europium was discovered in 1901 by Demarçay,* accompanying samarium, from which he separated it by fractional crystallisation of the double nitrates of magnesium and the earths. Demarçay considered that his new earth was identical with De Boisbaudran's $Z\epsilon$ and $Z\zeta$, and was the same which I had announced in 1885† as giving an extremely sharp red line in the phosphorescent spectrum at wave-length 609—an earth which in 1889‡ I said was a new one, and designated by the name of $S\delta$. I detected the earth $S\delta$ during an examination of the phosphorescent spectra given by some of the fractions of samaria and of yttria, neither of the earths being pure.

Europium is the first member of the terbium group, gadolinium being the second member. On the other side it comes next to samarium, the last member of the cerium group. Assuming the oxide of europium to be Eu_2O_3, the element has an atomic weight of 151·8, from the analysis of its sulphate, $Eu_2(SO_4)_3,8H_2O$.

* 'Comptes Rendus,' vol. 132, p. 1484, and 'Chemical News,' vol. 84, p. 1

† 'Phil. Trans.,' vol. 176, p. 691.

‡ 'Journ. Chem. Soc.,' vol. 55, pp. 250—285.